REMARKS

Applicants wish to thank the Examiner for considering the present application. The present application is under appeal but this RCE is being filed so that prosecution can continue and, thereafter, the appeal is hereby withdrawn. The RCE is timely filed since the Reply Brief for the above-identified patent application is due on February 11, 2003 since the Examiner's Answer was dated December 11, 2002. The rejections addressed herein are from the Final Office Action dated June 21, 2002. Applicants request the Examiner for a reconsideration of this application.

The following issues were are outstanding from the Final Office Action:

Whether claims 1, 4, 5, 7-9, 11, 13-18, 21-22, and 25-37 are patentable under 35 U.S.C. § 103(a) over either one of *Richards et al.* or *Karlsson* et al. in view of either one of *Chiba et al.* or *Suzuki et al.* and further in view of *Chang et al.*

Whether claims 2, 3, 10, 12, 19, 20, and 23-24 are patentable under 35 U.S.C. § 103(a) over the combined prior art above as applied to the claims set forth above and further in view of *Ajioka* and *Barrett et al.*

Claims 1, 4, 5, 7-9, 11, 13-18, 21-22, and 25-37 stand finally rejected under 35 U.S.C. §103(a) as obvious over either *Richards et al.* or *Karlsson et al.* in view of either one of *Chiba et al.* or *Suzuki et al.* and further in view of *Chang et al.*

Generally, claims 1, 4, 5, 7-9, 11, 13-18, 21-22, and 25-37 are similar in basic scope and thus the following arguments apply equally to the stated claims.

The independent claims have similar limitations and will therefore be argued together. The claims are directed toward an antenna for communication with a satellite constellation having a rotating plate for mechanically scanning for wave signals in azimuth, a plurality of radiation elements positioned on the rotating plate for receiving incoming waves, *coding circuitry coupling a respective code to the element signals* and apparatus, such as a multiplexer, for consolidating all the coded element signals received at each of the plurality of radiation elements and outputting an analog bit stream. Circuitry is also included for forming multiple digital beams from the analog bit stream. Part of providing the low cost system of the present invention is a

retrodirective mechanism as discussed for example on pages 13, 14, 15 and 16, lines 1-5. The signals are coded (according to their respective locations) and signal strengths monitored to determine the strongest signal. The location corresponding to the strongest signal is then used to transmit the transmit beam back to the satellite. This is accomplished by the coding circuitry mentioned above and the digital receiver that determines signal strengths for the coded element signal and locks onto a strongest signal having a corresponding element. The receiver causes a transmission using the corresponding elements. The claims have been amended to more particularly recite this retrodirective aspect. No new matter has been added.

As the Examiner recognized, both *Richards et al.* and *Karlsson et al.* fail to teach the use of a digital beamformer. (February 1, 2002 Office Action p. 2) These references thus also fail to teach at least the following (1) a multiplexer associated with each of the plurality of radiation elements, and (2) an analog to digital converter. The two references also fail to take into account the retrodirective aspect now recited in the amended claims. Neither reference codes element signals so that the direction of the strongest signal is used in determining what element to use when transmitting a beam.

Specifically, with respect to *Richards et al.*, this reference fails to disclose any details regarding its beamforming. In fact, there is no teaching or suggestion in *Richards et al.* to utilize digital beamforming techniques or a digital beamformer. Similarly, *Karlsson et al.* fails to disclose any details about digital beamforming.

The *Chiba* and *Suzuki* references also fail to teach retrodirectivity. The *Suzuki* reference is a mobile TDM/TDMA system with an active array antenna. No teaching or suggestion is provided about the retrodirective aspect. Likewise, the *Chiba* reference is directed to a digital beamforming system. No teaching or suggestion has been found in this reference for the retrodirectivity described above.

The *Chang* reference, on the other hand, teaches a digital beamforming technique using temporary noise injection. In the *Chang* reference, coding is provided for each of the signals. The signals are combined together in combiner 180 and

provided to two analog-to-digital converters after which decoding according to the codes is performed. *Chang*, however, neither teaches nor suggests the use of the coding for retrodirectivity. In other words, the element having the strongest signal is not determined so that a transmit beam may be transmitted using the same element. Therefore, because none of the references teaches or suggests determining the strongest signal and transmitting the transmit beam using the corresponding element, Applicants respectfully request the Examiner for a reconsideration of these rejections.

THE REJECTION OF CLAIMS 2, 3, 10, 12, 19, 20, and 23-24 UNDER 35 U.S.C. § 103(a)

Claims 2, 3, 10, 12, 19, 20, and 23-24 stand finally rejected under 35 U.S.C. §103(a) as obvious over the combined prior art set forth above as applied to the claims set forth above and further in view of *Ajioka* and *Barrett et al.*

The *Ajioka* reference teaches the use of dual polarized slot elements in a separated waveguide cavity. No teaching or suggestion is found in this reference that cures the deficiencies in teachings of the primary references discussed above. Namely, *Ajioka* does not teach or suggest beamforming or the retrodirective aspects of the claims.

The *Barrett* reference teaches the use of a waveguide having a tracking mechanism, particularly in Col. 10, lines 32-50. The *Barrett* reference provides separate steering arrays in Col. 12, line 55-Col. 3, line 22. This adds further expense to such a system. No teaching or suggestion is provided for the retrodirectivity features of the independent claims.

Because claims 2, 3, 10, 12, 19, 20, and 23-24 are further limitations of their base claims, Applicants respectfully request the Examiner for reconsideration of these claims for the same reasons set forth above.

In light of the above amendments and remarks, Applicants submit that all objections and rejections are now overcome. The application is now in condition for allowance and expeditious notice thereof is earnestly solicited. Should the Examiner

have any questions or comments, which would place the application in better condition for allowance, he is respectfully requested to call the undersigned attorney.

Respectfully submitted,

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APPENDIX: VERSION WITH MARKINGS TO SHOW CHANGES MADE

In The Claims:

1. (Amended) An antenna for communication with [an equatorial] a satellite [constellation], the antenna being for use on a [commercial] satellite terminal, comprising:

a [generally circular] rotating plate for mechanically scanning for wave signals in the azimuth direction;

a plurality of radiation elements positioned on said circular plate for electronically scanning for wave signals in elevation, said radiation elements forming respective element signals; [and]

coding circuitry coupling a respective code to a respective one of the element signals to form respective coded element signals;

a multiplexer associated with [each of] said plurality of radiation elements for consolidating the [individual wave] coded element signals received at each of said plurality of radiation elements to an analog bit stream;

an analog to digital converter for converting said analog bit stream to a digital bit stream;

circuitry for forming multiple digital beams corresponding to respective coded element signals from said digital bit stream; and

a digital receiver [for converting said digital beams into an information signal] determining signal strengths for the coded element signal and locking onto a strongest signal having a corresponding element, said receiver causing a transmission using the corresponding element [;

wherein the antenna is able to lock onto a second equatorial satellite in the constellation before locking off a first equatorial satellite].

7. (Amended) [A phased array] An antenna for communication with an equatorial satellite constellation, comprising:

a rotating plate for mechanically scanning for a wavefront of wave signals in an azimuth direction;

a plurality of radiation elements positioned on said rotating plate for receiving a [plurality of individual waves] the wave signals and generating respective element signals in response thereto;

coding circuitry coupling a respective code to a respective one of the element signals to form respective coded element signals;

apparatus for positioning said radiation elements such that [a] the wavefront [of an intended signal] will be in alignment with a major axis of said plurality of radiation elements;

a multiplexer device being in communication with each of said plurality of radiation elements for converting said plurality of [received individual waves] coded element signals into an analog bit stream;

an analog to digital converter for converting said analog bit stream to a digital bit stream;

a device for forming multiple digital beams from said digital bit stream; and

a digital receiver for processing said multiple digital beams to determine a corresponding element with a strongest signal strength, said receiver causing a transmission using the corresponding element;

wherein the antenna is able to lock onto a second equatorial satellite in the constellation before locking off a first equatorial satellite.

13. (Amended) A method for forming multiple beams at a [commercial] satellite antenna comprising:

providing a plurality of radiation elements on a surface of said [commercial] satellite antenna for receiving a plurality of individual wave signals <u>and forming respective element signals</u>;

rotating said plurality of radiation elements such that a wavefront of said plurality of individual wave signals is in alignment with a major axis of said plurality of radiation elements;

<u>coding the respective element signals to form coded element signals;</u>

consolidating said plurality of [wave signals] <u>coded element signals</u> into [a single] <u>an</u> analog signal;

forming multiple beams from said [single] analog signal;

<u>determining signal strengths for the coded element signals and determining a strongest signal of the signal strengths and a corresponding element, and</u>

<u>transmitting a transmit beam using the corresponding element</u> [and transmitting said multiple beams to a plurality of satellites in an equatorial satellite constellation;

whereby the antenna is able to lock onto a second equatorial satellite in the constellation before locking off a first equatorial satellite].

21. (Amended) A phased array antenna for communication with an equatorial satellite constellation, comprising:

a rotating plate for electronically scanning for a wavefront of wave signals in elevation and for mechanically scanning for said wavefront of wave signals in an azimuth direction;

a plurality of elongated radiation elements positioned on said rotating plate for receiving [a plurality of individual waves] <u>the wave signals and generating elements signals in response to the wave signals</u>, each of said plurality of radiation

elements having a major axis and a minor axis;

apparatus associated with [each of] said plurality of radiation elements for coding the elements signals according to location to form coded elements signals and consolidating the coded element signals [wave signals] received at each of said plurality of radiation elements into a first bit stream; [and]

a multiple beam former for forming multiple beams from said first bit stream; and

a receiver for determining a corresponding element with a strongest signal strength, said receiver causing a transmission using the corresponding element.

26. (Amended) The antenna of Claim 21, wherein said apparatus for coding and consolidating the wave signals [is] comprises a multiplexer.

30. (Amended) A method of communicating with an equatorial satellite constellation, comprising:

providing a plurality of generally parallel [radiation] waveguide elements on a surface of a [commercial] satellite antenna;

rotating said satellite antenna such that a wavefront of a [plurality of individual] wave signal [signals] is in alignment with a major axis of said plurality of [radiation] waveguide elements;

forming a plurality electrical waveguide signals;

consolidating said plurality of [wave] electrical waveguide signals into a [single] digital bit stream;

forming multiple beams from said [single] bit stream; [and]

determining a strongest beam and corresponding waveguide;

transmitting a [said multiple beams] transmit beam to a [plurality of satellites] satellite in the equatorial satellite constellation using the corresponding waveguide.

33. (Amended) The method of Claim 30, further comprising:

[converting said single signal to a digital bit stream; and]

forming multiple digital beam forms from said digital bit stream.

36. (Amended) The method of Claim 31, further comprising:

monitoring signal strength from an adjacent [received individual] wave [signals] signal in order to track other satellites in the equatorial satellite constellation.

37. (Amended) A [commercial] satellite terminal for communication with an equatorial satellite constellation comprising:

an antenna including,

a one-dimensionally [generally circular] rotating plate for mechanically scanning for wave signals in the azimuth direction;

a plurality of elongated [radiation] waveguide elements having a predetermined location positioned generally parallel to one another on said [circular] plate for electronically scanning for wave signals in elevation, said waveguide forming an electrical waveguide signal in response to the wave signals;

coding circuitry coupling a respective code to a respective element signal to form respective coded waveguide signals;

a multiplexer associated with [each of] said plurality of [radiation elements] waveguides for consolidating the [individual wave] waveguide signals received at each of said plurality of [radiation elements] waveguides to a first bit stream; [and]

a multiple beam former for forming multiple beams from said first bit stream;

a receiver for determining a strongest waveguide signal strength from a corresponding waveguide, said receiver causing a transmission using the corresponding waveguide.